

## EXHIBIT B

## EVIDENCE OF USE FOR U.S. PATENT NO. 8,610,573

Title: Radio frequency module and methods of transmitting/receiving data

Application No.: US 12/558,484

Filing Date: September 11, 2009

Issue Date: December 17, 2013

### Accused Product:




### HyperMesh / FHSS

Based on Murata proprietary frequency hopping spread spectrum (FHSS) technology, the Murata HyperMesh / FHSS modules are especially well-suited to commercial, industrial and factory environments. They ensure long-range data throughput even in the presence of electrical noise and multi-path fading. Murata offers two lines of unique, HyperMesh / FHSS modules.

- DNT Series 900 MHz and 2.4 GHz Low-Cost, Multi-Purpose FHSS Networking are highly-reliable multi-purpose HyperMesh / FHSS modules for sensor networking for RF data rates of 38 kb/s to 500 kb/s, and offered at a very low-price.

Source: <https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss>



 HyperMesh / FHSS  
**DNT24CA**

## Overview

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### **Low cost, low power consumption, multi-purpose, multi-function 2.4 GHz frequency hopping OEM RF module**

- 2.4GHz Proprietary FHSS Module


### **Small size SMT module with on module chip antenna**



- Analog and Digital I/O for Sensor Applications
- Sleep mode and auto-reporting make it ideal for battery powered applications
- Pin-for-pin Compatible with Murata DNT90CA 900MHz Module

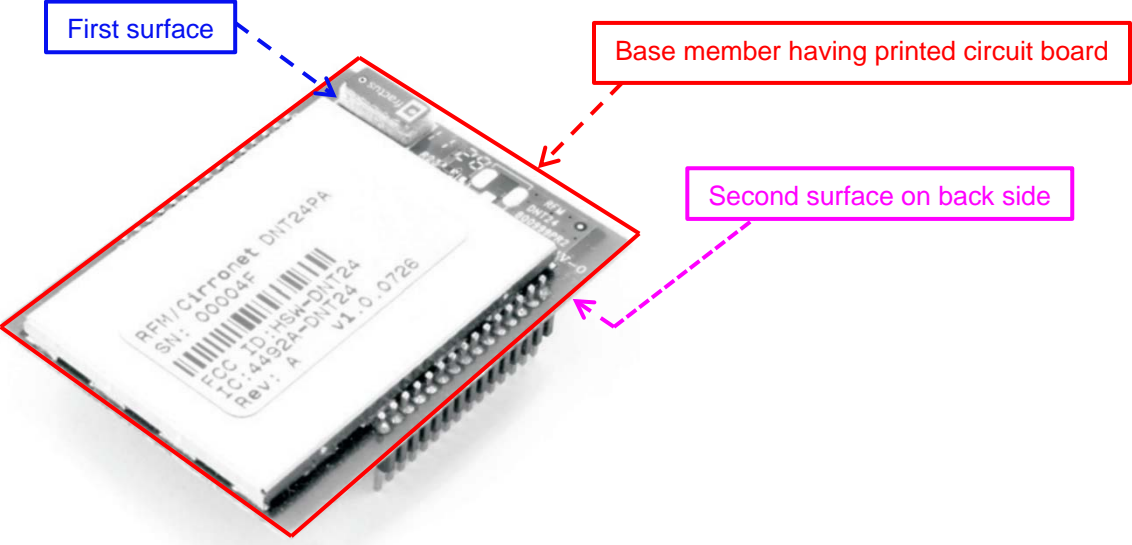


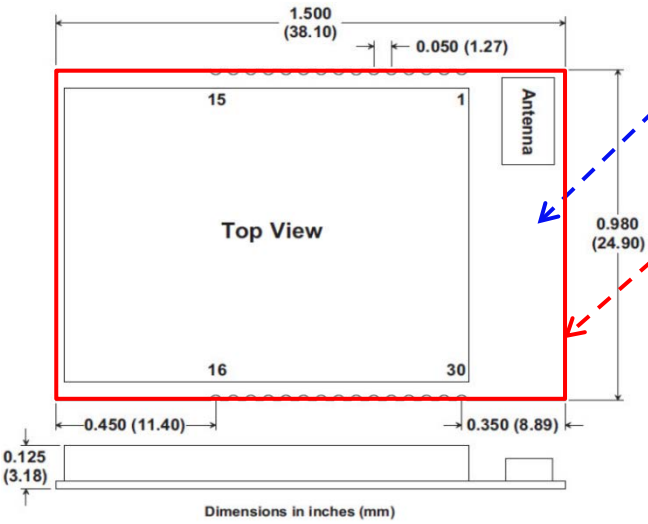
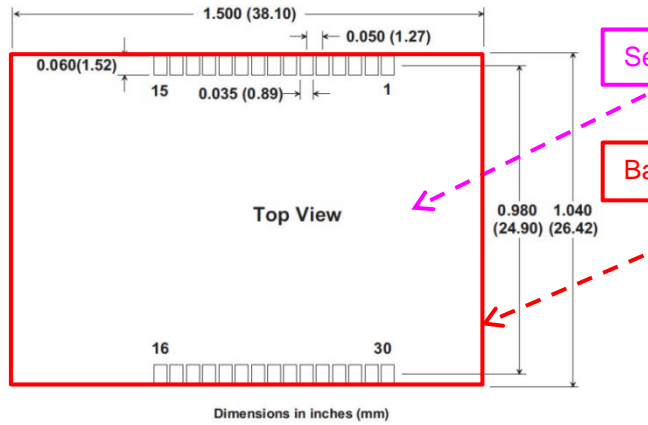
Source: <https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss/overview/lineup/dnt24ca>

**Evidence of Use**

Claim Language	Evidence of Infringement
<p>1. A radio frequency module comprising:</p>	<p>Murata Electronics provides DNT24CA FHSS Transceiver module (i.e., “radio frequency module”) with 2.4 GHz frequency hopping module for the data communication.</p> <div data-bbox="583 414 1606 998"> <div data-bbox="674 414 974 532" style="border: 2px solid red; padding: 5px; display: inline-block;"> HyperMesh / FHSS  <b>DNT24CA</b> </div>  <div data-bbox="1272 630 1606 699" style="border: 2px solid red; padding: 5px; display: inline-block;"> Radio frequency module </div> </div> <p>Source: <a href="https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss/overview/lineup/dnt24ca">https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss/overview/lineup/dnt24ca</a></p>

Claim Language	Evidence of Infringement
	<div data-bbox="596 285 1167 354">  </div> <p data-bbox="596 412 1892 542">Based on Murata proprietary frequency hopping spread spectrum (FHSS) technology, the Murata HyperMesh / FHSS modules are especially well-suited to commercial, industrial and factory environments. They ensure long-range data throughput even in the presence of electrical noise and multi-path fading. Murata offers two lines of unique, HyperMesh / FHSS modules.</p> <ul data-bbox="596 581 1839 678" style="list-style-type: none"> <li>• DNT Series 900 MHz and 2.4 GHz Low-Cost, Multi-Purpose FHSS Networking are highly-reliable multi-purpose HyperMesh / FHSS modules for sensor networking for RF data rates of 38 kb/s to 500 kb/s, and offered at a very low-price.</li> </ul> <p data-bbox="596 717 1583 743">Source: <a href="https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss">https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss</a></p> <div data-bbox="596 776 747 818"> <b>Overview</b> </div> <hr data-bbox="596 834 1864 837"/> <div data-bbox="596 915 1205 967"> <b>Low cost, low power consumption, multi-purpose, multi-function 2.4 GHz frequency hopping OEM RF module</b> </div> <ul data-bbox="596 990 869 1013" style="list-style-type: none"> <li>• 2.4GHz Proprietary FHSS Module</li> </ul> <div data-bbox="1251 915 1709 938"> <b>Small size SMT module with on module chip antenna</b> </div> <ul data-bbox="1251 964 1860 1052" style="list-style-type: none"> <li>• Analog and Digital I/O for Sensor Applications</li> <li>• Sleep mode and auto-reporting make it ideal for battery powered applications</li> <li>• Pin-for-pin Compatible with Murata DNT90CA 900MHz Module</li> </ul> <div data-bbox="1856 922 1892 964">  </div> <p data-bbox="596 1088 1871 1114">Source: <a href="https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss/overview/lineup/dnt24ca">https://www.murata.com/en-us/products/connectivitymodule/proprietary-fhss/overview/lineup/dnt24ca</a></p>

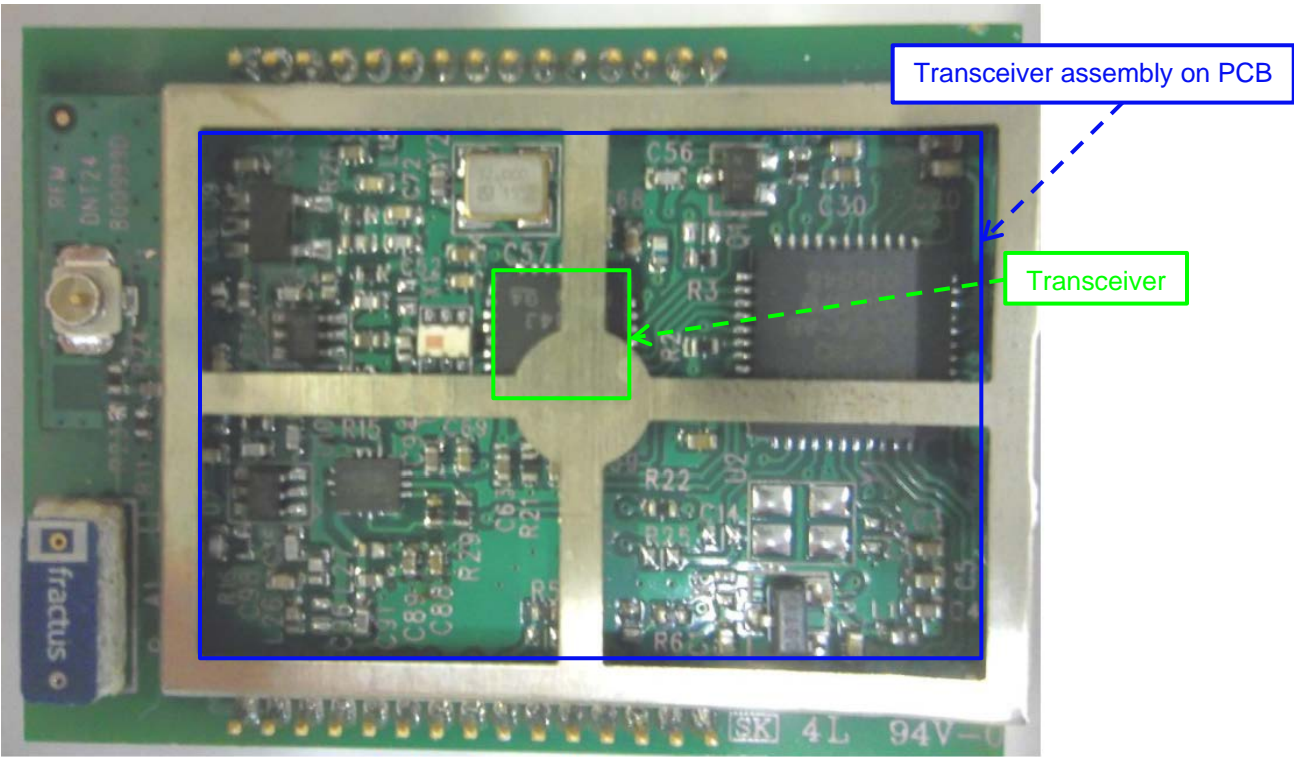
Claim Language	Evidence of Infringement
<p>a base member including a printed circuit board having a first surface and a second surface;</p>	<p>Murata Electronics DNT24CA FHSS Transceiver module includes a printed circuit board (PCB) that has a first and a second surface.</p>  <p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 1 of 7)</p>

Claim Language	Evidence of Infringement
	<p><b>DNT24CA Outline and Mounting Dimensions</b></p>  <p>Top View</p> <p>Dimensions in inches (mm)</p> <p><b>DNT24CA Solder Pad Dimensions</b></p>  <p>Top View</p> <p>Dimensions in inches (mm)</p>

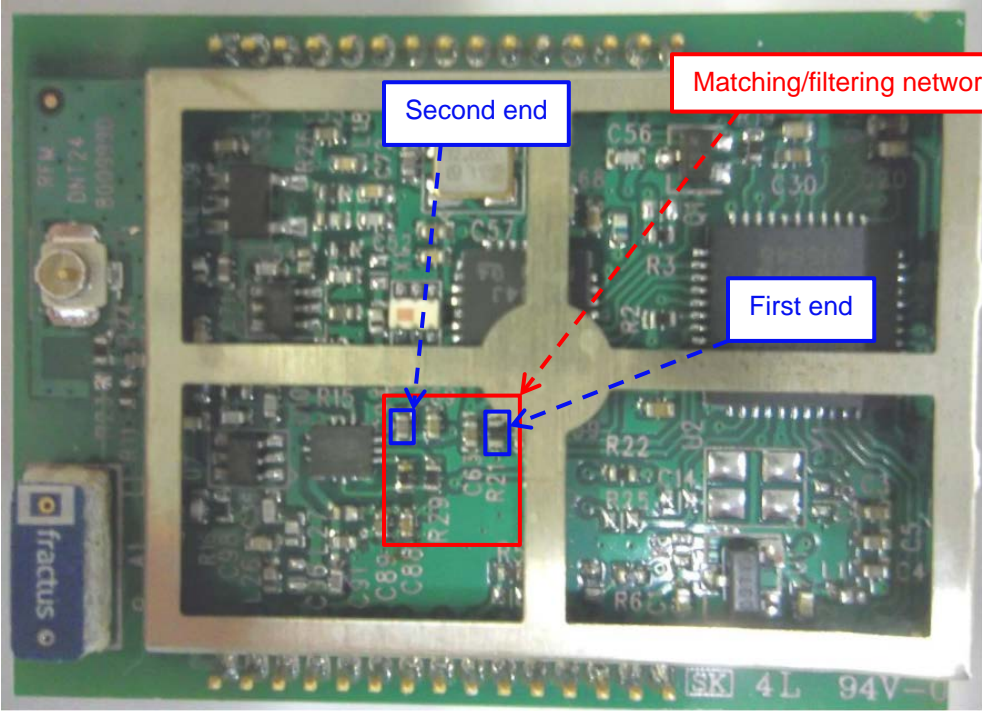
Claim Language	Evidence of Infringement
	<p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 6 of 7)</p>



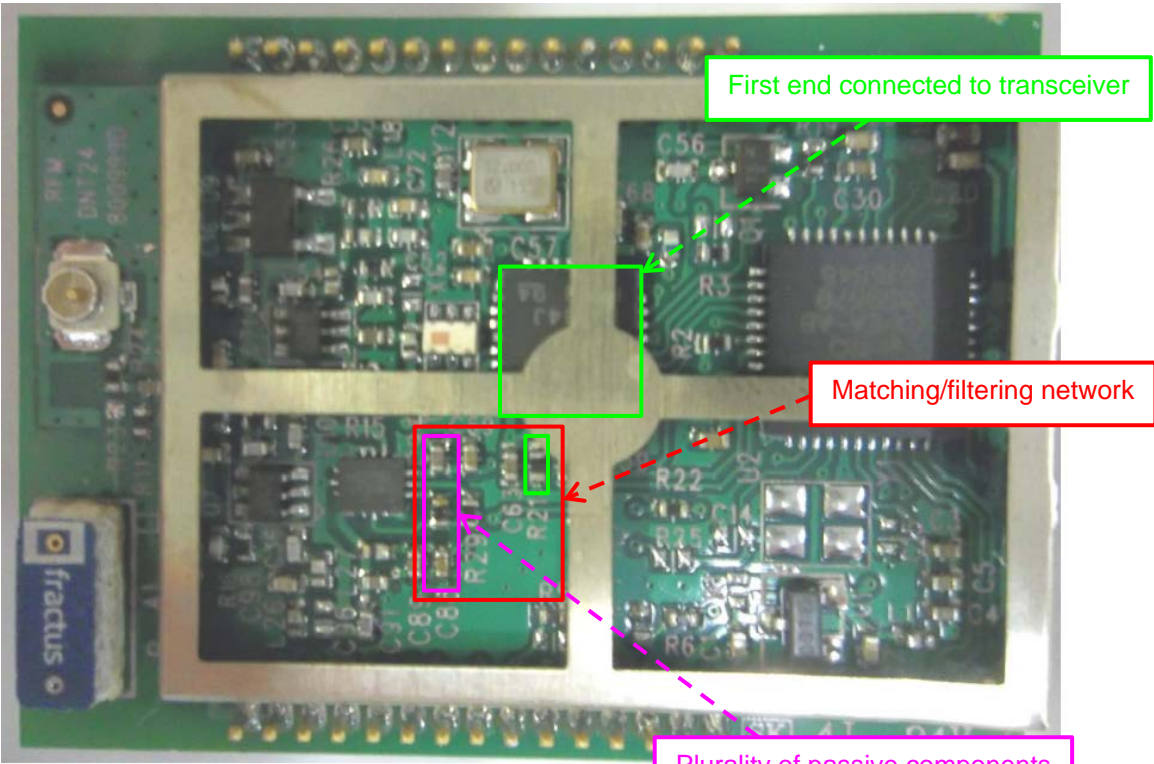
Claim Language	Evidence of Infringement
<p>a transceiver assembly located on the printed circuit board and including:</p> <p>a transceiver; and</p>	<p>Murata DNT24CA module deployed with 2.4 GHz transceiver module (i.e., “transceiver”) in a transceiver assembly.</p> <div data-bbox="590 380 1818 1149"> <p>The block diagram illustrates the internal components of the DNT24CA/DNT24PA module. A central Microcontroller is connected to a 2.4 GHz Transceiver (highlighted in green). The transceiver is connected to a Chip Antenna through a Filter and RFIO. Various pins are shown, including GND, ACT (DIAG_TX), /DCD (DIAG_RX), GPIO0, RADIO_TXD, RADIO_RXD, GPIO4 (/HOST_CTS), GPIO5 (/HOST_RTS), DAC0, GPIO2, GPIO1, GPIO3 (DAV), DAC1, VCC, and a +3.3 V Reg. The 2.4 GHz Transceiver is also connected to a PWR and PRE block, which is connected to a Filter and RFIO. The diagram is labeled 'DNT24CA/DNT24PA Block Diagram' and 'Figure 1'.</p> </div> <p>Figure 1</p> <p>Transceiver assembly on PCB</p> <p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 3 of 7)</p>

Claim Language	Evidence of Infringement
	 <p>The image shows a top view of a green printed circuit board (PCB) assembly. A blue rectangular box highlights a central section of the board, which is labeled "Transceiver assembly on PCB" with a blue dashed arrow. Within this blue box, a green rectangular box highlights a specific component, labeled "Transceiver" with a green dashed arrow. The PCB features various electronic components, including capacitors (C56, C30, C57, C31, C86, C88, C89, C14, C29, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100), resistors (R3, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100), and a "fractus" logo on the left side. The PCB is mounted on a larger board, with a "SK 4L 94V-0" marking at the bottom.</p> <p><b>Figure 1. Top View</b></p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>

Claim Language	Evidence of Infringement
	<p><b><u>DNT24CA/PA Hardware</u></b></p> <p>The major components of these modules include a <u>2.4 GHz FHSS transceiver</u> and a low current 8-bit microcontroller. These modules operate in the 2.4 GHz ISM band. There are 12 selectable hopping patterns providing compatibility with frequency allocations in most regions of the world. The modules also have two selectable RF output power levels: 6.3 mW and 63 mW.</p> <p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 3 of 7)</p>

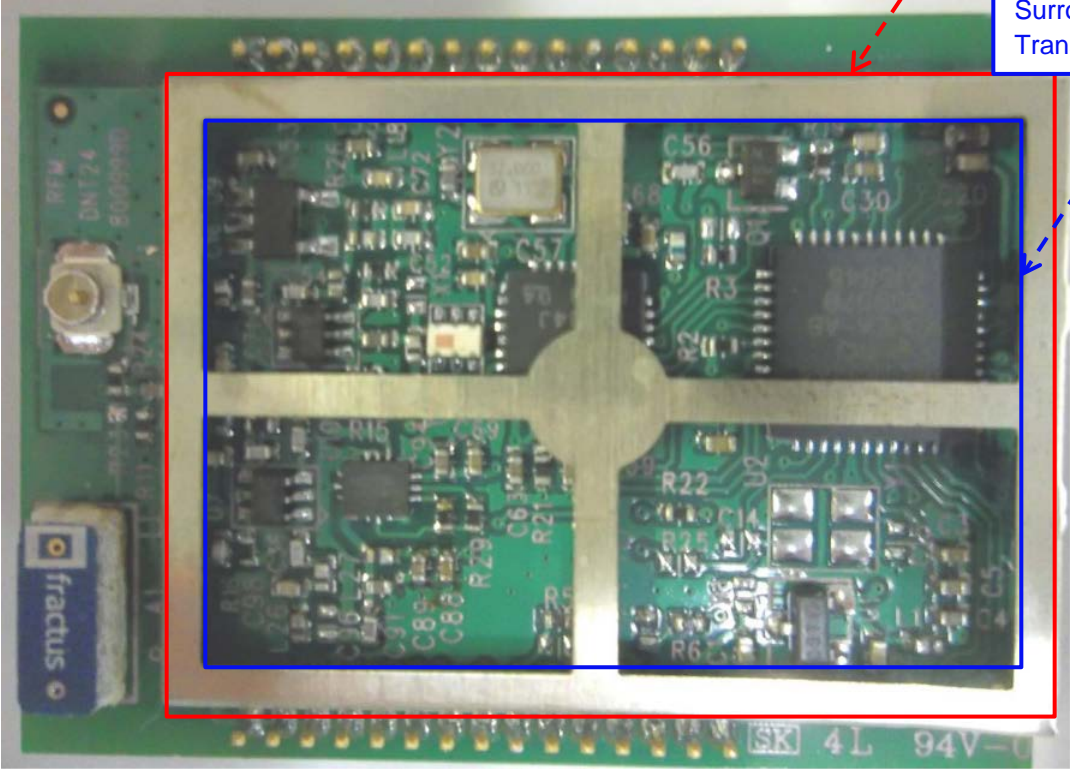
Claim Language	Evidence of Infringement
<p>a matching/filtering network having first and second ends;</p>	<p>Murata DNT24CA module includes a matching/filtering network circuit. The primary characteristic of a matching network is to maximize power transfer from the source (transceiver) to load (antenna). Therefore, RF design demands that a matching/filtering network block be placed between the chip and the antenna, forming a filter and differential antenna connection between the IC transceiver and the antenna. The matching/filtering network comprises passive components such as inductors and capacitors (shown in patent specification provided below).</p>  <p><b>Figure 1. Top View</b></p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>

Claim Language	Evidence of Infringement
	<p>A matching network is connected between a source and a load, and its circuitry is usually designed such that it transfers almost all power to the load while presenting an input impedance that is equal to the complex conjugate of the source's output impedance. Alternatively, you can think of a matching network as transforming the output impedance of the source such that it is equal to the complex conjugate of the load impedance.</p> <p>Source: <a href="https://www.allaboutcircuits.com/textbook/radio-frequency-analysis-design/selected-topics/understanding-matching-networks/">https://www.allaboutcircuits.com/textbook/radio-frequency-analysis-design/selected-topics/understanding-matching-networks/</a></p> <p><b>Patent Specification:</b></p> <p>The RF matching/filtering network <u>62</u> is also connected to the chip antenna <u>15</u> and preferably comprises a plurality of passive electrical components <u>72</u> including inductors and capacitors connected in series and arranged in an in-line configuration that extends generally parallel with the ground plane segment <u>32</u> inside the shield <u>22</u>. The inductors and capacitors <u>72</u> form a filter and differential antenna connection</p> <p>Source US8610573, col 4, lines 61-66</p>

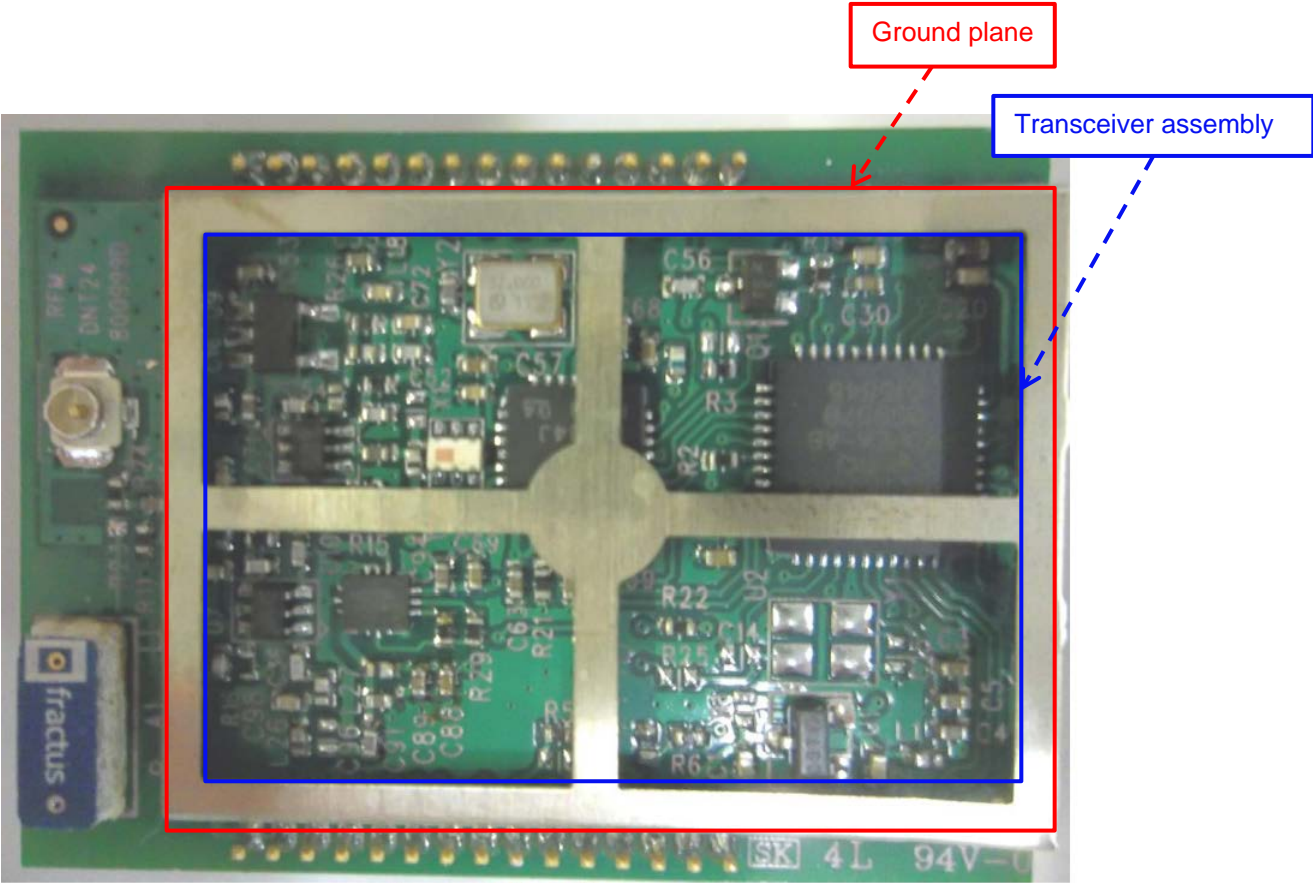
Claim Language	Evidence of Infringement
<p>the matching/filtering network having a plurality of passive series connected electrical components in a linear arrangement, with the first end thereof electrically connected to the transceiver;</p>	<p>Murata DNT24CA module's matching/filtering network forms a linear arrangement with the components where the first end is connected to 2.4 GHz transceiver module (i.e., "transceiver"). RF modules. The matching/filtering networks comprise passive components such as inductors and capacitors. RF modules usually comprise passive filters which comprise passive components such as resistors, capacitors, and inductors. Further, at least some of the passive components are in a linear arrangement with two ends of a component each connected to a different component (series connection) rather than both ends being connected to the same component (parallel connection).</p>  <p>The image shows a top view of a Murata DNT24CA module. A green rectangular area highlights the matching/filtering network. A red dashed line points from the text 'First end connected to transceiver' to the top of the green area. A red dashed line points from the text 'Matching/filtering network' to the green area. A red dashed line points from the text 'Plurality of passive components' to a specific component within the green area. A red dashed line points from the text 'First end connected to transceiver' to the top of the green area. A red dashed line points from the text 'Matching/filtering network' to the green area. A red dashed line points from the text 'Plurality of passive components' to a specific component within the green area.</p> <p><b>Figure 1. Top View</b></p>

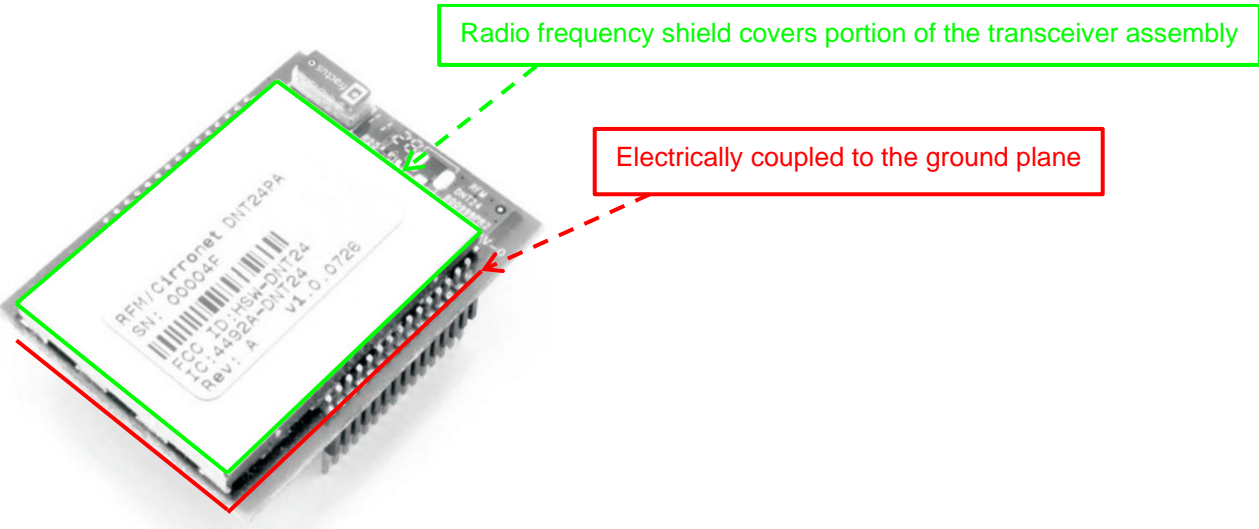
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	<p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>

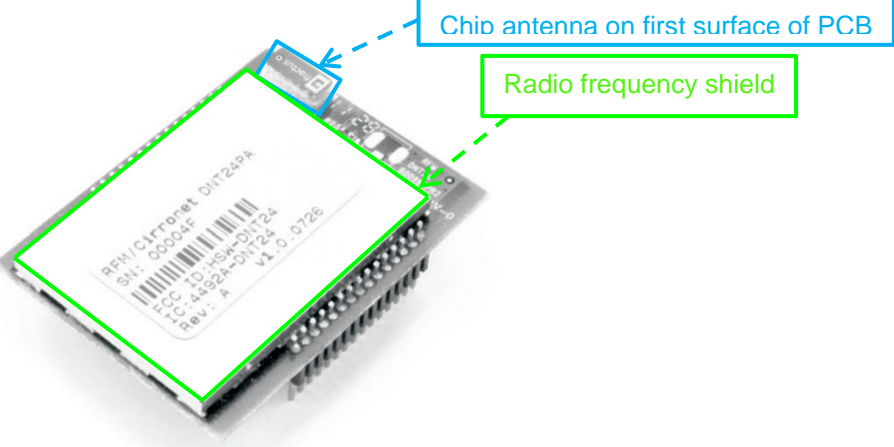


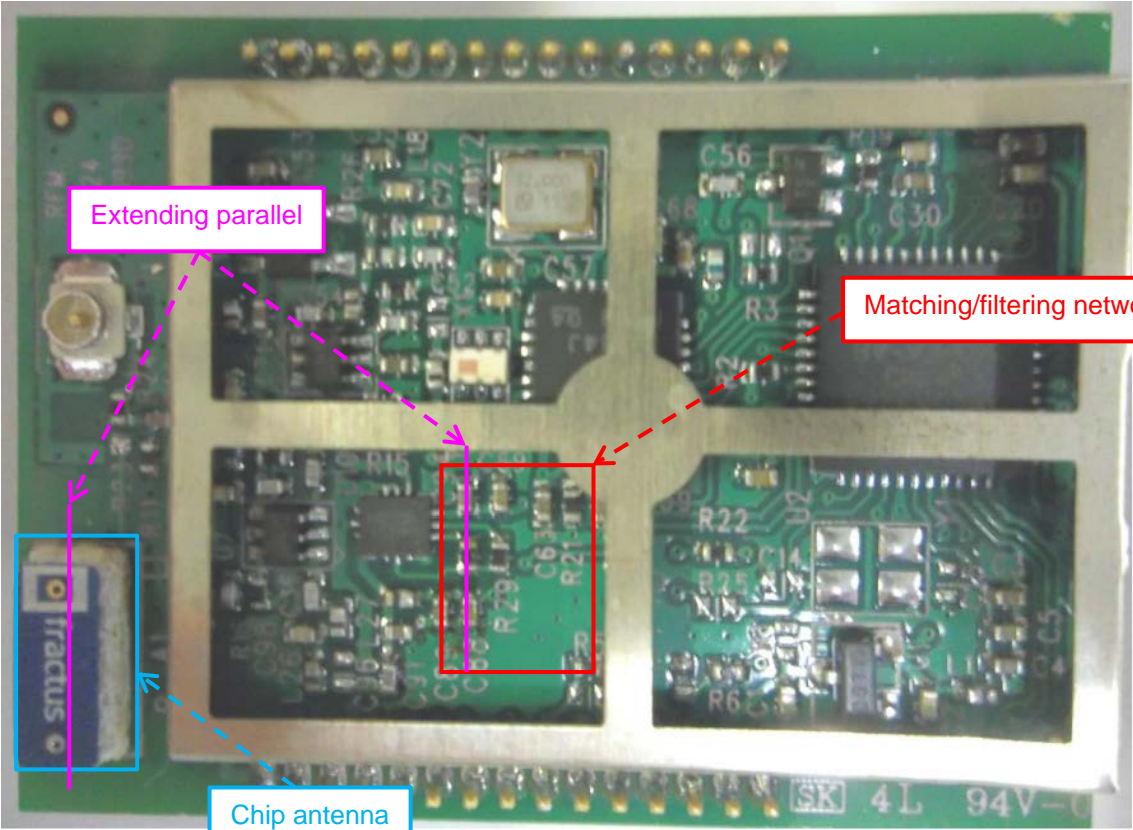
Claim Language	Evidence of Infringement
<p>a ground plane formed on the first surface and surrounding at least a substantial portion of the transceiver assembly;</p>	<p>Murata DNT24CA module includes a metal segment (i.e., “ground plane”) on the PCB surface that surrounds a portion of the transceiver assembly.</p>  <p>The image shows a top view of a green printed circuit board (PCB) with various electronic components. A large, rectangular, metallic ground plane is visible, surrounding a central portion of the board. This central portion contains a transceiver assembly, which is highlighted by a blue dashed line. The ground plane is highlighted by a red solid line. A red dashed arrow points from the text 'Ground plane on the first surface' to the ground plane. A blue dashed arrow points from the text 'Surrounding Transceiver assembly' to the transceiver assembly.</p> <p><b>Figure 1. Top View</b></p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>



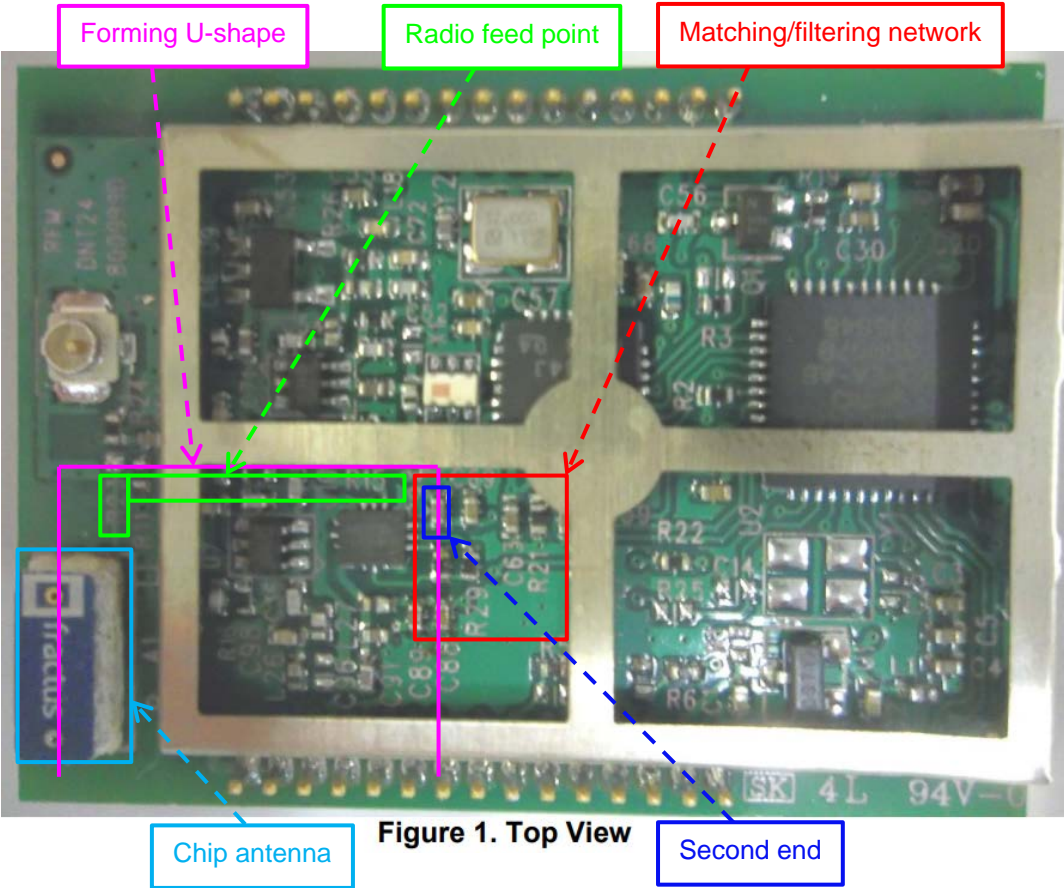
Claim Language	Evidence of Infringement
<p>a radio frequency shield electrically coupled to the ground plane and covering at least a substantial portion of the transceiver assembly;</p>	<p>Murata DNT24CA module includes a shield (i.e., “radio frequency shield”) that covers the transceiver assembly and is soldered to the metal segment (i.e., “ground plane”).</p>  <p><b>Figure 1. Top View</b></p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>

Claim Language	Evidence of Infringement
	<div data-bbox="604 277 1856 802"><p>Radio frequency shield covers portion of the transceiver assembly</p><p>Electrically coupled to the ground plane</p></div> <p data-bbox="590 834 1644 922">Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 1 of 7)</p>

Claim Language	Evidence of Infringement
<p>a chip antenna located on the first surface of the printed circuit board outside of the shield and extending generally parallel with the matching/filtering network; and</p>	<p>Murata DNT24CA module includes a dielectric chip antenna outside of the shield placed on the first surface of the PCB. The chip antenna extends in parallel with the inductor and capacitor network (i.e., “matching/filtering network”). The top view of the module with the shield removed is provided below which depicts that the longitudinal directions of the chip antenna and the matching/filtering network extend parallel to each other.</p>  <p>The image shows a top-down view of a Murata DNT24CA module. A green rectangular outline highlights the radio frequency shield, which covers most of the top surface. A blue dashed arrow points to a small component on the first surface of the PCB, labeled 'Chip antenna on first surface of PCB'. The shield is labeled 'Radio frequency shield' in a green box. The module has a white label with the following text: RFM/C1770net DNT24CA, SN: 00004F, FCC ID: H5K-DNT24, IC: 4432A-DNT24, Rev: A, V1.0 0726.</p> <p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 1 of 7)</p>

Claim Language	Evidence of Infringement
	 <p><b>Figure 1. Top View</b></p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p> <p>The DNT24CA and DNT24PA FHSS transceiver modules provide a low-cost, versatile solution for wireless data communications in the 2.4 GHz ISM band. The RF output power can be set at 6.3 or 63 mW. The modules include analog, digital and serial I/O, providing the flexibility to serve applications ranging from cable replacements to sensor networks. <u>The built-in chip antenna makes these modules very easy to integrate.</u></p>

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	<p>Source: <a href="https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000">https://www.murata.com/-/media/webrenewal/products/connectivitymodule/asset/pub/rfm/data/dnt24ca.ashx?la=en-us&amp;cvid=20210615064715000000</a> (Page 1 of 7)</p>

Claim Language	Evidence of Infringement
<p>a radio feed point extending between the chip antenna and the second end of the matching/filtering network, the chip antenna together with the matching/filtering network and the feed point forming a generally U-shape.</p>	<p>Murata DNT24CA module has a feed point between the chip antenna and the second end of the matching/filtering network. This arrangement forms a U-shape with the components.</p>  <p>Figure 1. Top View</p> <p>Source: <a href="https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf">https://fccid.io/HSW-DNT24/Internal-Photos/Internal-Photos-2552785.pdf</a> (Page 1 of 1)</p>